

# Watersheds, the Water-Cycle, and You

**WSU Cooperative  
Extension King County**

# **Watersheds, the Hydrologic-Cycle and You**

- What is a Watershed
- The Water-Cycle
- Natural Watershed Features
- **Humans and Watersheds**
  - Land Uses
  - Degradation Processes
  - Management and Mitigation

## Human Land Uses

- **Forestry**
- **Agriculture**
- **Land Development**
- **General Household Practices**
- **Recreation (such as boating and fishing)**



# Forestry



Photo courtesy of Rural Technology Initiative



Photos courtesy of USFS

**King County  
lost 33% of its  
forestland  
between 1972  
and 1996**



# Western King County

1972



1996



# Agriculture



**Willamette (Oregon)  
and Puget Sound  
(Washington)  
Valleys had 283,000  
acres of farmland  
converted to urban  
between 1982 and  
1992. 78,000 of  
these acres were  
prime or unique  
farmlands**



# Land Development



**King County's population up 40 percent between 1980 and 1998, from 1.2 to 1.7 million.**

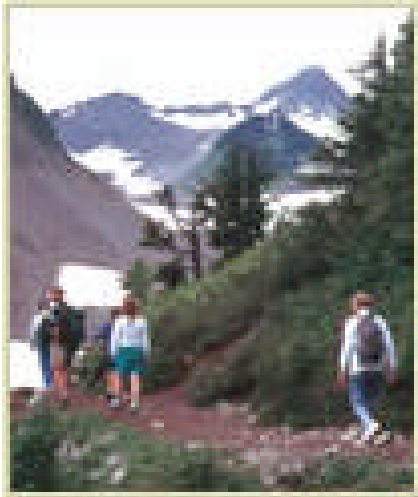


Photos courtesy of USDA NRCS

# General Household Practices



# Recreation



Photos courtesy of  
(clockwise from middle  
top): USDA-NRCS,  
USFS, Washington  
State Parks (bottom  
three) and USFS.

# Watershed Degradation Processes

- Physical
- Chemical
- Biological

# Physical

- **Remove/Displace Water**
- **Clear Vegetation**
- **Create Impervious Surfaces**
- **Alter wetlands, stream channel, shoreline**
- **Sedimentation**
- **Temperature Alteration**
- **Debris and Trash**

# Removal or Displacement of Water



**From river to  
reservoir...**



**to pipeline...**



**to you.**

# Removal or Displacement of Water

- Many water uses...
- Draw down and move surface and groundwater.
- Less water of lower quality available to replenish streams and aquifers.



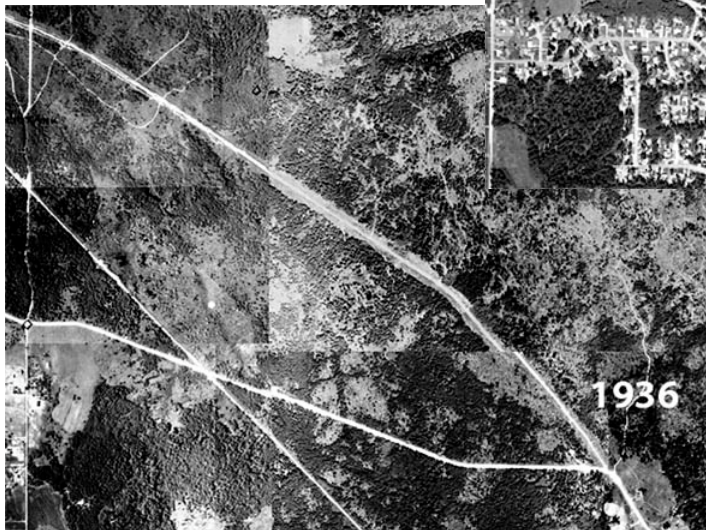
Photos courtesy of NRCS

# Removal/Clearing of Vegetation

- Less pools/riffles...wider and shallower stream
- Less aquatic life
- More sediments/pollution and bank erosion
- Higher water temperatures
- More flooding and lower late summer flows



## Creation of Impervious Surfaces Near Renton, King County



Photos courtesy of King County

# **Impervious Surfaces**

## **Causes and Effects**

- **Causes**
  - **Forest Loss**
  - **Soil Compaction/Grading**
  - **Land Development**
- **Effects**
  - **More surface water runoff**
  - **Water quality impacts**
  - **Potential fish habitat and wetland impacts**

# Alteration of Wetland, Stream Channel or Shoreline

- Filling
- Draining/Ditching
- Damming
- Dredging
- Diking
- Channelizing
- Armoring
- Culverting/Piping



Photos courtesy of USDA-NRCS

# Sedimentation

- **Surface water runoff**
- **Stream bank erosion**



# Temperature Alteration

- Loss of riparian shade
- Stream widening



Photo Courtesy of Ohio EPA, from  
[http://www.ysu.edu/mahoning\\_river/ohio\\_epa\\_photos/065.JPG](http://www.ysu.edu/mahoning_river/ohio_epa_photos/065.JPG)

# Debris and Trash



- Illegal dumping
- Street litter
- Yard waste (lawn clippings, leaves)

# Sources of Chemical and Biological Pollutants

- Point Sources
- Non-Point Sources



Photo courtesy of USDA-NRCS

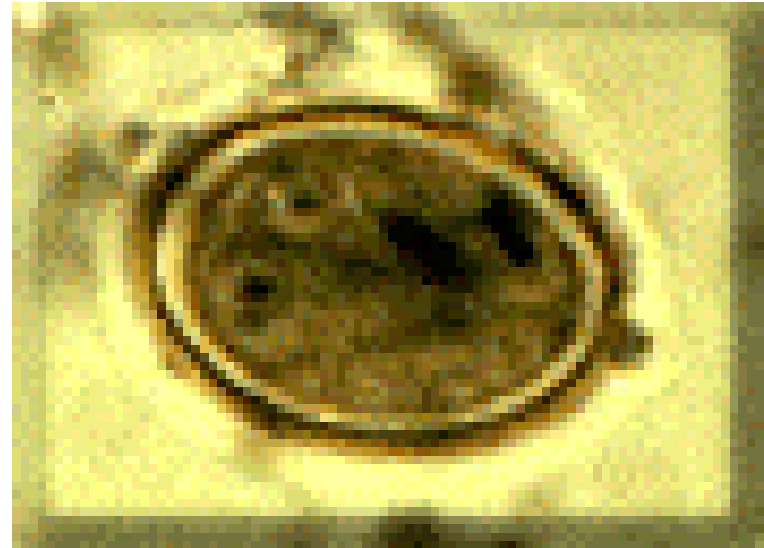
# Chemical

- Herbicides
- Pesticides
- Fertilizers
- Industrial/Household
- Automotive



# Biological

- Pathogens and Bacteria
- Manure and Sewage/Septic
- Invasive Non-Native Plants



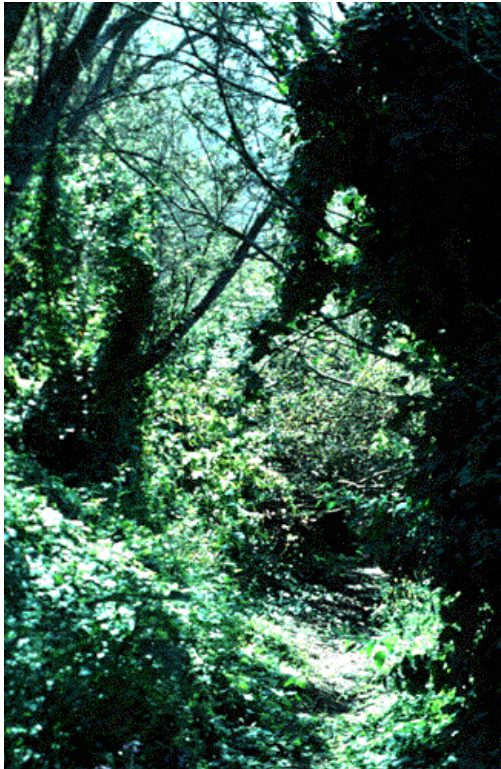
Giardia lamblia – Cyst in stool

By D. Despommier

<http://www-medlib.med.utah.edu/parasitology/>

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# Invasive Non-Native Plants



English Ivy  
close-up and  
in the  
woods.



From King County Forest Inventory Presentation

Scotch Bloom

# Management and Mitigation Practices

- Regulatory and Non-Regulatory
- Technology and Engineering
- Prevention and Conservation
- Restoration
- Civic Participation

# Regulatory Practices

- **Government laws and regulations:**
  - Federal: activities and resources on federal land
  - State: activities and resources on state land
  - Local: land use activities such as building
- **May apply to:**
  - Water quantity and quality
  - Watershed features (wetlands, stream buffers)
  - Fish and wildlife
  - Land use activities
- **To be effective...must be enforced.**

# Non-Regulatory Practices

- **Best management practices (BMPs)**
- **Tax incentives**
- **Direct monetary compensation**
- **Technical assistance**
- **Homeowner education**

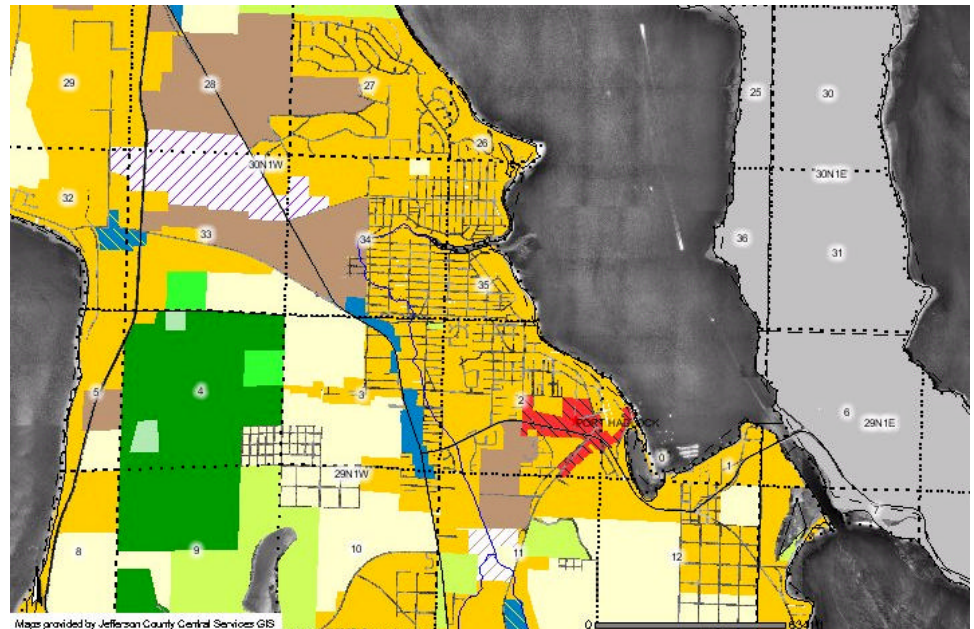


**Technical assistance on preparing farm plan.**

Photo courtesy of WSDA-NRCS

# Technology and Engineering

- Used extensively
- Address existing impacts (e.g. wastewater, cleared land.)
- Water quality and quantity:
  - Water retention and treatment
  - Water conservation
- Required by regulation and/or integrated into BMPs.
- Geographical Information System mapping and planning



# Prevention and Conservation

- Address watershed impacts before they occur:
  - Use non-toxic alternatives
  - Conserve water in and outside of the house
  - Acquire land to protect water quality, wildlife, and open space.

# Restoration

- Restore degraded watershed features:
  - Plant native vegetation
  - Replace road culverts
  - “Rebuild” streambeds
- Supported by:
  - Fishery enhancement groups
  - Conservation districts
  - Government agencies
  - Volunteer groups
- Public and private land funding



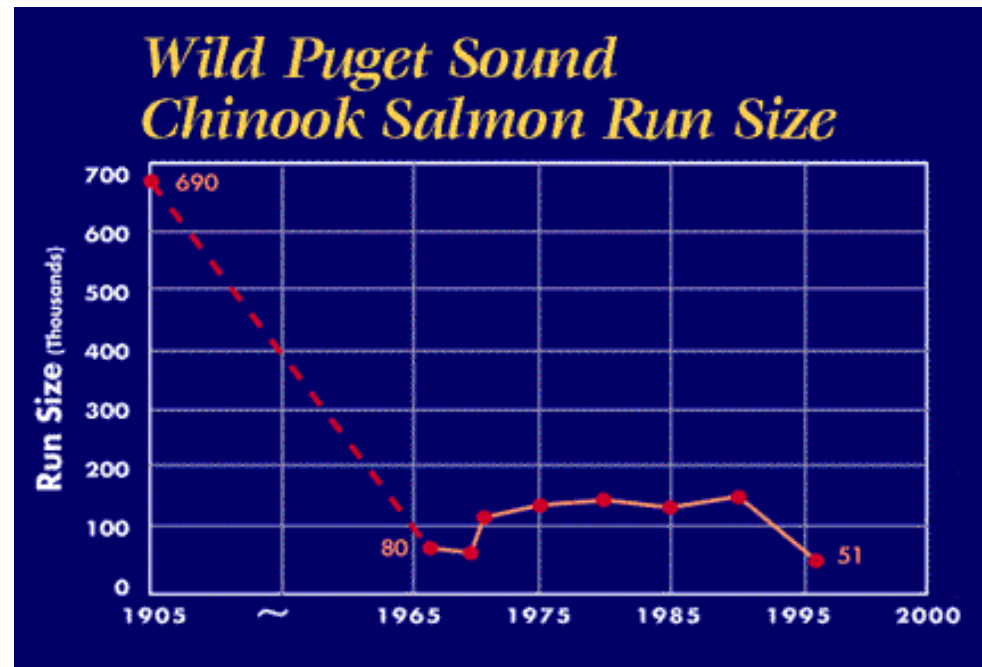
# Civic Participation



- **Importance of public participation:**
  - Cornerstone of democracy
  - Sustains good planning decisions
  - Reduces costs
  - Maintains trust in government
- **Avenues for public participation:**
  - Community meetings
  - Public meetings and hearings
  - Written comments
- **Land use conflicts:** where desire to protect a public benefit restricts human activities

## Case Study: Decline of Wild Salmon

- More than 314 stocks of PNW salmon at moderate to high risk of extinction in coastal WA, OR, and northern CA.
- Resident fish also in decline and at risk (bull trout, Oregon Chub, and Olympic Mudminnow).
- Physical, Chemical, and Biological factors of decline



From King County  
Salmon Speakers  
Bureau Slide Show

# Factors of Decline

- **Physical habitats simplified**
- **Loss of secondary channels, oxbows, and backwaters...important fish habitats.**
- **Change from forests/wetlands to impervious surfaces**
- **Loss of riparian vegetation**
- **Dams/water allocations**
- **Other fish barriers (culverts, pipes)**
- **Water pollution (point and non-point sources)**
- **Sedimentation/erosion**
- **Hatchery salmon (competition/disease/genetic changes)**
- **Pulse (natural) versus Press (human) disturbances**

# Goals of Salmon Recovery

- **Use Management and Mitigation Practices to:**
  - **Maintain/restore natural watershed processes**
  - **Maintain/restore habitat and network of refugia**
  - **Maintain connectivity between high quality habitat**
  - **Maintain genetic diversity**



